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## ABSORBENT ARTICLE USING EXTENSIBLE LEG CUFFS

Background of the Invention

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Technical Field

This invention pertains to an absorbent article for containing exudates. Such absorbent articles generally utilize leg cuffs to help  
10 prevent leakage of body exudates.

Description of the Related Art

Absorbent articles such as infant diapers, training pants, adult  
15 incontinence products, and the like are well known. Such articles have achieved a wide acceptance due to their ability to receive and absorb body exudates. In order to provide comfort to a user and contain exudates, the prior art generally discloses the use of leg elastics along the longitudinal edges of the base structure, or containment flaps  
20 extending longitudinally of the absorbent article and spaced inwardly of the longitudinal edge.

For example, U.S. Patent 3,400,718 to Saijo discloses a sanitary belt including strips (6) which are attached in the crotch area by stitching. These strips are attached to the diaper in a relaxed state.  
25 The strips 6 are stretchable in two directions. The device of Saijo comprises a reusable holder for feminine napkins.

U.S. Patent 5,137,526 to Coates discloses isolation gussets (22) for controlling transverse leakage in a reusable infant or adult diaper. The gussets are attached in the crotch portion of the diaper.

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These devices both attempt to prevent the leakage of exudates by the user thereof. Neither device discloses partially stretching the leg cuff when mounting the leg cuff onto the holder or diaper.

## 5 Summary of the Invention

This invention relates to an absorbent article designed to absorb body exudates. The absorbent article includes an absorbent core located between a bodyside liner and an outer cover. Leg cuffs formed by strips  
10 of material are attached to the absorbent article in the crotch portion thereof. The leg cuffs can be placed at a particular angle and shaped to provide increased comfort and leakage protection for a user. The leg cuffs are also formed of a material which stretches to provide greater comfort to a user. The leg cuffs are partially stretched when the  
15 inboard edges of the leg cuffs are mounted to the absorbent article. This partial stretching allows the leg cuff to gather the base structure of the absorbent article, thus providing a comfortable nongapping or snug fit for users with small legs. The outboard edge of the leg cuff thus can stretch a distance greater than the length of the inboard edge of the  
20 leg cuff. Therefore, the leg cuff can stretch beyond a length of the base structure along which the leg cuff is attached, to accommodate users with larger legs. Mounting the leg cuffs to the absorbent article at an angle of between about 5 degrees and about 25 degrees in combination with a narrow crotch width also prevents pull down of the front portion of the  
25 absorbent article. These arrangements increase the comfort for a user and also increase the sealing effect of the leg cuffs, with minimal distortion of the absorbent article.

Some of the objects of the invention are obtained in a first embodiment comprising an absorbent article having a front portion, a rear  
30 portion and a crotch portion connecting the front and rear portions, with a longitudinal axis extending through the front, rear and crotch portions, the absorbent article having opposing longitudinal sides with the longitudinal axis disposed therebetween, the absorbent article comprising an outer cover; a bodyside liner mounted to the outer cover,  
35 the outer cover and the bodyside liner forming, in combination, a base structure; an absorbent core located between the bodyside liner and the outer cover; and first and second extensible leg cuffs attached to the base structure along the respective opposing longitudinal sides of the

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absorbent article at the crotch portion, the leg cuffs being partially stretched when the base structure is fully extended; whereby the leg cuffs retract and gather the base structure in the crotch portion when the extensible leg cuffs are relaxed.

5 In most embodiments, the leg cuffs each have an outboard edge spaced outwardly from a respective lateral edge of the base structure and an inboard edge mounted upon a respective portion of the base structure, each outboard edge preferably being attached at ends thereof to a respective portion of the base structure.

10 In some embodiments, the extensible leg cuffs are the entire source of elastic tension for the opposing longitudinal sides at the crotch portion of the absorbent article.

In other embodiments, the leg cuffs each have an outboard edge spaced outwardly from a lateral edge of the base structure, at least the  
15 respective outboard edges of the leg cuffs remaining further extensible when the base structure upon which the leg cuffs are mounted is fully extended. Further the entire surface of each of the leg cuffs that faces the base structure may be attached to the base structure at respective portions thereof.

20 In still other embodiments, each respective leg cuff has an unattached width thereof, between the base structure and the outboard edge of the respective leg cuff, of between about 0.1 inch and up to the full-width of the leg cuff piece. In part because of the lack of attachment, at least the outboard edges of the respective leg cuffs,  
25 spaced outwardly from a lateral edge of the base structure, are movable independent of the base structure of the absorbent article.

In yet other embodiments, the leg cuffs are stretched from about 5% to about 95%, and preferably 20% to 50%, of the total potential elongation of the leg cuffs, when the base structure is fully extended.

30 In another set of preferred embodiments, the leg cuffs have a maximum elongation of approximately 200% of the relaxed length of the leg cuffs. The leg cuffs are also approximately 1.5 inches wide and exert approximately 225 grams of restorative force at 90% elongation.

The invention further comprehends the leg cuffs having rectangular,  
35 elliptical or contoured shapes and a length to width ratio of between about 2:1 and about 20:1, preferably about 5:1 to about 15:1, most preferably about approximately 7:1. These length to width ratios are measured as attached to the diaper chassis.

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In another embodiment, the leg cuffs comprise a laminate including first and second outer nonwoven facing layers on opposing sides of an elastomeric core layer, the elastomeric core layer comprising a thermoplastic elastomeric composition such as a styrene ethylene butylene styrene terpolymer. Further, the leg cuffs can be attached to the bodyside liner, as well as, or in addition to, the outer cover.

Other materials which may comprise the leg cuffs include: spandex/nonwoven laminates, elastomeric meltblowns, cross-machine direction stretchable materials made with stretchable nonwovens, stretchable foams and the like.

The invention further comprehends an absorbent article having a front portion, a rear portion and a crotch portion connecting the front and rear portions, with a longitudinal axis extending through the front, rear and crotch portions, the absorbent article having opposing longitudinal sides, with the longitudinal axis disposed therebetween, the absorbent article comprising an outer cover; a bodyside liner mounted to the outer cover, the outer cover and the bodyside liner forming, in combination, a base structure; an absorbent core located between the bodyside liner and the outer cover; and first and second extensible leg cuffs attached to the base structure along the respective opposing longitudinal sides of the absorbent article at the crotch portion, the leg cuffs each having an outboard edge spaced outwardly from a respective lateral edge of the base structure, and an inboard edge mounted upon the respective portion of the base structure; whereby each outboard edge is stretchable to a length greater than the length of the respective inboard edge and being retractable to a length less than the length of the respective inboard edge.

The invention also comprehends an absorbent article having a front portion, a rear portion and a crotch portion connecting the front and rear portions, a longitudinal axis extending through the front, rear and crotch portions, the absorbent article having opposing longitudinal sides, with the longitudinal axis disposed therebetween, the absorbent article comprising an outer cover; a bodyside liner mounted to the outer cover, the outer cover and the bodyside liner forming, in combination, a base structure; an absorbent core located between the bodyside liner and the outer cover; and first and second extensible leg cuffs attached to the base structure along the respective opposing longitudinal sides of the absorbent article at the crotch portion, the leg cuffs each being

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mounted at an angle between 5 degrees and 25 degrees with respect to the longitudinal axis, the apex of the angle being located toward the front portion of the absorbent article; whereby the absorbent article substantially conforms to the shape of the user's body when mounted thereon.

The invention further comprehends an absorbent article having a front portion, a rear portion and a crotch portion connecting the front and rear portions, with a longitudinal axis extending through the front, rear and crotch portions, the absorbent article having opposing longitudinal sides with the longitudinal axis disposed therebetween, the absorbent article comprising an outer cover; a bodyside liner mounted to the outer cover, the outer cover and bodyside liner forming, in combination, a base structure; an absorbent core located between the bodyside liner and outer cover; and first and second extensible leg cuffs attached to the base structure along respective opposing longitudinal sides of the absorbent article at the crotch portion, the leg cuffs being partially stretched when the base structure is fully extended, the leg cuffs being stretched a different length at an inboard edge which is mounted upon a respective portion of the base structure than a length at an outboard edge of the leg cuff, whereby the leg cuffs retract and gather the base structure in the crotch portion when the extensible leg cuffs are relaxed. The different length at an inboard edge can be smaller, but preferably is greater than the length at the outboard edge of the leg cuff. The different length at the inboard edge with respect to the outboard edge of each said leg cuff causes the leg cuffs to have a curved shape when attached to the base structure, even if the leg cuff comprises a rectangular shaped piece of material.

#### Brief Description of the Drawings

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Fig. 1 illustrates a top view of an absorbent article according to the present invention with rectangular shaped leg cuffs.

Fig. 2 illustrates a top view of another embodiment of the absorbent article with leg cuffs that have an elongated elliptical shape.

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Fig. 3 illustrates a top view of yet another embodiment of the absorbent article including leg cuffs with a contoured shape.



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Fig. 4 illustrates a cross-sectional view taken at 4-4 of Fig. 1, showing attachment of the leg cuff to the bodyside liner and the outer cover.

Fig. 5 illustrates a cross-sectional view as in Fig. 4 wherein the leg cuff is attached to the outer cover.

Fig. 6 illustrates a cross-sectional view as in Fig. 4 wherein the leg cuff is attached to the bodyside liner.

Fig. 7 shows one embodiment of the materials comprising the respective leg cuffs.

The invention is not limited in its application to the details of construction and the arrangement of the components set forth in the following description or illustrated in the drawings. The invention is capable of other embodiments or of being practiced or carried out in various ways. Also, it is to be understood that the terminology and phraseology employed herein is for purpose of description and illustration and should not be regarded as limiting. Like reference numerals are used to indicate like components.

#### Detailed Description of the Preferred Embodiments

20

The present invention relates to absorbent articles designed to absorb body exudates. While the preferred embodiments of the present invention are described herein in terms of an absorbent article such as a diaper for an infant, the invention includes, and is equally applicable to adult incontinent briefs, training pants and the like.

25

The present invention can best be understood by reference to the drawings. Fig. 1 illustrates a top view of one embodiment of the invention where an absorbent article 8 comprises a front portion 10, a rear portion 12, and a crotch portion 14 located between and connecting the front portion 10 and the rear portion 12. A longitudinal axis 15 extends centrally through the front portion 10, the rear portion 12 and the crotch portion 14 of the absorbent article 8. The absorbent article 8 also includes a bodyside liner 16, an absorbent core 18, fasteners 20 on a rear portion 12 of the absorbent article 8, attachment means 22 on a front portion 10 of the absorbent article 8 and extensible leg cuffs 24 in the crotch portion 14 of the absorbent article 8 on opposing sides of longitudinal axis 15. The bodyside liner 16 and an outer cover 26 shown in Figs. 4-6, in combination, form a base structure 28. An inboard edge

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30 of the extensible leg cuff 24 is attached to the base structure 28 by heat sealing, sonic bonding, adhesive bonding or the like. The leg cuffs 24 span the length of the leg cut out or opening 31 in the crotch portion 14 of the absorbent article 8. Adhesive bonding includes the use of glue lines, glue dots and/or other arrangements. An outboard edge 32 of the extensible leg cuff 24 may be attached by similar means at its ends to the base structure 28. The outboard edge 32 is spaced outwardly from a lateral edge 33 of the base structure 28 at least in the center region of the leg cuff 24. The base structure 28 preferably also has a relatively narrow width "W" which may be tapered as shown in Fig. 1, across the crotch portion 14.

The fasteners 20 can comprise a mechanical fastener such as the hook of a hook and loop fastening system mounted on outer cover 26 of base structure 28. The attachment means or other fastener surface 22 then comprises a corresponding loop material attached to the outer cover 26 and adapted to releasably engage with the hook material of the first fastener 20. Other well known fastening means can also be used to support the absorbent article 8 upon a person. For example, a cohesive system, an adhesive fastener system or the like may also be utilized to fasten the absorbent article 8.

A suitable bodyside liner 16 may be manufactured from a wide selection of web materials, such as porous foams, reticulated foams, apertured plastic films or natural fibers. For example, the bodyside liner 16 may comprise wood or cotton fibers. Other possible materials are synthetic fibers, such as polyester or polypropylene fibers, or a combination of natural and synthetic fibers. Bodyside liner 16 is suitably utilized to help isolate the liquids held in the absorbent core 18 from the wearer's skin.

Various woven and nonwoven fabrics can be used for bodyside liner 16. For example, bodyside liner 16 may be composed of a meltblown or spunbonded web of polyolefin fibers. The bodyside liner 16 may also comprise a carded and/or bonded web composed of natural and/or synthetic fibers. The bodyside liner 16 may also be composed of a substantially hydrophobic material wherein the hydrophobic material is treated with a surfactant or otherwise processed to impart a desired level of wettability and hydrophilicity. In a particular embodiment of the present invention, the bodyside liner 16 may comprise a spunbonded polypropylene fabric composed of about 2.8-3.2 denier fibers formed into

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a web having a basis weight of about 22 grams per square meter and a density of about 0.06 grams per cubic centimeter. The fabric is treated with about 0.3 weight percent of a surfactant. The bodyside liner 16 may comprise a multiplicity of components, layers, or partial layers, which correspond to any of the materials disclosed herein, as well as others known in the art.

The absorbent core 18 suitably comprises a matrix of hydrophilic fibers, such as a web of cellulosic fluff, preferably in combination with a high-absorbency material commonly known as superabsorbent material. In a particular embodiment, absorbent core 18 comprises a mixture of superabsorbent hydrogel-forming particles and wood pulp fluff. In place of the wood pulp fluff, one may use synthetic, polymeric, meltblown fibers or a combination of meltblown fibers and natural fibers. The superabsorbent material may be substantially homogeneously mixed with the hydrophilic fibers or may be otherwise combined into the absorbent core.

Alternatively, the absorbent core 18 may comprise a laminate of fibrous webs and superabsorbent material or other suitable means of maintaining a superabsorbent material in a localized area.

The absorbent core 18 can have any of a number of shapes. For example, the absorbent core may be rectangular, T-shaped as shown in Figs. 1-3 or I-shaped. It is generally preferred that the absorbent core 18 be narrower in the crotch portion 14 than the rear and/or front portions 12, 10.

The high-absorbency material in the absorbent core 18 can be selected from natural, synthetic and modified natural polymers and materials. The high absorbency materials can be inorganic materials, such as silica gels, or organic compounds, such as crosslinked polymers. The term crosslinked refers to any means for effectively rendering normally water-soluble materials substantially water insoluble but swellable, whereby absorbent properties are available but the swelled material is substantially immobile after absorbing water-based liquids. Such means can include, for example, physical entanglement, crystalline domains, covalent bonds, ionic complexes and associations, hydrophilic associations such as hydrogen bonding, and hydrophobic associations or Van der Waals forces.

It is generally preferred that the outer cover 26 of the absorbent article 8 be formed from a material which is substantially impermeable to liquids. A typical outer cover 26 may be manufactured from a thin

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plastic film or other flexible liquid-impermeable material. For example, the outer cover 26 can be formed by a polyethylene film having a thickness of from about 0.012 millimeters to about 0.051 millimeters. When it is desirable that the outer cover 26 have a more clothlike feeling, it may comprise a polyethylene film laminated to a surface of a nonwoven web, such as a spunbond web of polyolefin fibers. For example, a polyethylene film having a thickness of about 0.015 millimeters may have thermally or otherwise laminated thereto a spunbond web of polyolefin fibers having a thickness from 1.5 to 2.5 denier per filament, which nonwoven web has a basis weight of about 24 grams per square meter. Further, the outer cover 26 can be formed of a woven or nonwoven fibrous web which has been totally or partially constructed or treated to impart a desired level of liquid impermeability to selected regions that are adjacent or proximate the absorbent core 18. Still further, the outer cover 26 may optionally be composed of a micro-porous material which permits vapors to escape from the absorbent core 18 and through outer cover 26 while preventing liquid exudates from passing through the outer cover 26.

Optionally, inner containment flaps 34 shown in the cross-sectional views in Figs. 4 and 5 may be utilized to contain exudates in the center of the crotch portion 14 of the absorbent article 8. Containment flaps 34, in combination with the extensible leg cuffs 24, provide enhanced protection against leakage of exudates from the absorbent article 8, because exudates must pass around two barriers in order to leak out of the absorbent article 8 in a lateral direction in the crotch portion 14. First, exudates must pass around the respective containment flap 34. Then the exudates must also pass around the respective leg cuffs 24. The containment flaps 34 impede flow of exudates to leg cuffs 24, such that the quantity of exudates reaching leg cuffs 24 is reduced according to the amount retained by containment flaps 34. The leg cuffs 24 more effectively impede flow of this reduced quantity of exudates, whereby the potential for transverse leakage of exudates past the leg cuffs 24 is reduced by the operation of containment flaps 34 at loci disposed inwardly of the leg cuffs 24.

The containment flaps 34 are preferably mounted upon the bodyside liner 16 e.g. near, or at the longitudinal edges, of the absorbent core 18 in a substantially parallel orientation with respect to the longitudinal axis 15 as illustrated in Figs. 4 and 5, or may, for

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example, be mounted substantially parallel the side edges 37 of absorbent core 10 or side edges of the base structure 28, along the length of the crotch portion 14, maintaining straight-line extensions of that orientation across front and rear portions 10, 12.

5       The containment flaps 34 are preferably mounted on the bodyside liner 16 outwardly spaced from the absorbent core 18 and inwardly spaced from the leg cuffs 24. The containment flaps 34 can run the entire length of the absorbent article 8 through the front portion 10, crotch portion 14 and the rear portion 12. In the alternative, the containment  
10       flaps 34 can be present only in the crotch portion 14 of the absorbent article, or in the crotch portion 14 and part of one or both of the front portion 10 and rear portion 12.

      The containment flaps 34 may include flap elastics (not shown) which comprise, for example, one or more individual strands of elastomeric  
15       material. A suitable elastic strand may, for example, be composed of a 470 decitex LYCRA® elastomer or other elastomers with suitable characteristics. The containment flaps 34 may comprise any flap configuration or design well known in the art.

      The containment flaps 34 may be constructed of a material which is  
20       the same as, or different than the material comprising bodyside liner 16. Alternatively, the containment flaps 34 may comprise a material which is the same as the material used in outer cover 26. The containment flaps 34 are preferably liquid impervious. The containment flaps 34 may be  
25       formed from a polymeric film material or from e.g. a nonwoven material which has been treated so as to be substantially liquid impervious. The containment flaps 34 may be formed by a single or multiple layer of material with appropriate elastics secured thereto. Other arrangements are also contemplated. For example, the elastics may be placed at multiple spaced locations on the containment flap 34.

30       Each extensible leg cuff 24 is preferably formed of a separate length of material which is subsequently attached to the base structure 28. As shown in the cross-sectional view of Fig. 4, the extensible leg cuff 24 can be bonded or otherwise attached to outer cover 26 and  
35       bodyside liner 16 between facing surfaces of outer cover 26 and bodyside liner 16, over an area extending from an outer lateral edge 36 of the bodyside liner 16 and an outer lateral edge 38 of the outer cover 26, in the crotch portion 14 of the absorbent article 8, generally to the inboard edge 30 of the leg cuff 24. The combination of attachment to

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both the bodyside liner 16 and the outer cover 26 constitutes attachment to the base structure 28 because the base structure 28 is formed by both the bodyside liner 16 and the outer cover 26.

The extensible leg cuff 24 can, in the alternative, be adhesively bonded or otherwise attached only to the outer cover 26 of the base structure 28 as shown in the cross-sectional view of Fig. 5. Further, as illustrated in the cross-sectional view of Fig. 6, the leg cuffs 24 can also be attached only to the bodyside liner 16 of the base structure 28.

In all of the arrangements illustrated, at least part of the leg cuff 24 is spaced outwardly from a lateral edge 33 of the base structure 28. The lateral edge 33 of the base structure 28 comprises at least one of the outer lateral edge 36 of the bodyside liner 16 and the outer lateral edge 38 of the outer cover 26.

The leg cuff 24 can be bonded or attached to the base structure 28 by any suitable web attachment means, such as the use of adhesives, ultrasonic bonding or a combination thereof. Other possible attachment methods include stitching, plastic welding, solvent bonding and the like. Preferably, the entire portion of the surface of the leg cuff 24 which faces the base structure 28 is attached to the base structure 28. Fig. 1 illustrates ultrasonic bonds 35. The ultrasonic bonds enhance the securement of the leg cuffs 24 upon the base structure 28. These ultrasonic bonds are placed in each of the respective corners of the elongated rectangular shaped leg cuff to supplement the bonds at other portions of the leg cuff 24 already attached to the base structure 28 as shown in Fig. 1.

The preferred material for the leg cuffs 24 is a laminate of an elastomeric core layer 42 with bicomponent spunbonded facing layers 40 on opposite sides of the elastomeric core layer. The elastomeric core layer 42 preferably comprises a styrene ethylene butylene styrene terpolymer, such as a KRATON® G polymer from Shell Chemical Company. As shown in Fig. 7, the elastomeric core layer 42 which comprises a barrier to fluid is placed between spunbonded facing layers 40 to form a 3-layer stretch-bonded laminate. While a terpolymer is preferred, other polymers such as copolymers can also provide an elastomeric core layer with similar properties.

As used herein, a "stretch-bonded laminate" is a multiple layer structure comprised of at least a two layers in which one layer is a gatherable layer and the other layer a stretchable layer. The layers are

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joined together when the stretchable layer is in a stretched condition so that, upon relaxing the layers, the gatherable layer is gathered by the retractile forces exerted by the stretchable/stretched layer. The stretchable layer can be a film of stretchable material or a plurality of strands of a stretchable material. The extensible leg cuffs 24 of the invention are preferably stretchable only in the lengthwise direction. In the alternative, the leg cuffs 24 may be stretchable in both the lengthwise and crosswidth directions. Other materials, which can form the middle or elastomeric core layer 42, include an elastomeric material or a stretchable meltblown material which is a barrier to fluid. For example, a carded web may comprise the elastomeric core layer 42. Other materials which may comprise the leg cuffs 24 include neck-bonded laminates, or the like. The material forming the leg cuff 24 typically has a maximum elongation of about approximately 200% of the relaxed length of the leg cuff 24. The material forming the leg cuffs also has a cross-directional stiffness in the range of 50 to 1,100 milligrams as measured on a Gurley bending stiffness tester according to TAPPI test number T5430m-94. The preferred cross-directional stiffness is at least 300 milligrams.

The extensible leg cuffs 24 preferably are bonded to the base structure 28 of the absorbent article 8 while partially stretched in a direction extending along the length of the leg cuff 24. The leg cuffs 24 are stretched from 5% to 95% of their total potential elongation and are attached to the base structure 28 in such partially stretched condition, with the base structure extended preferably to its stretching limit. At minimum, the percent elongation of a leg cuff 24 at attachment to the base structure 28 is greater than the percent elongation of the base structure 28 at the respective facing surfaces of base structure 28 and leg cuff 24.

The inboard edge 30 of the leg cuff 24 can also be stretched a different length than the outboard edge 32 of the leg cuff. In this instance, the length at the inboard edge 30 can be smaller, but preferably is greater than the length at the outboard edge 32 of the leg cuff 24. Such an arrangement means that the inboard edge 30 is stretched with a greater force than the outboard edge 32 of the leg cuff 24. Another effect of stretching the inboard edge 30 a different length than the outboard edge 32 is that the leg cuff 24 has a curved shape when attached to the base structure 28, even if the leg cuff 24 comprises a

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rectangular shaped piece of material. This arrangement can be used with contoured, elliptical or otherwise shaped leg cuffs 24 as well as a rectangular shaped leg cuff 24. This arrangement substantially conforms the leg cuff 24 to a user's body in the leg cut out opening 31.

5 Preferably, the leg cuffs 24 are stretched between 50% and 80% of the total potential elongation of the leg cuffs 24 when attached to the base structure 28 which is fully extended. In one embodiment, the leg cuffs are 1.5 inches wide and exert approximately 225 grams of retractile force at 90% ultimate elongation. The partial stretching of the leg  
10 cuff 24 before mounting the leg cuff 24 to the base structure 28 allows the outboard edge 32 of the leg cuff 24 to be subsequently stretched, after the leg cuff 24 is mounted to the base structure 28, to a length greater than the length of the respective inboard edge 30 which is attached to the base structure 28 and effectively unable to stretch  
15 beyond the length of that portion of the base structure 28 along which the leg cuffs 24 are mounted. The partial stretching of the leg cuff 24 also allows the outboard edge 32 to retract to a length less than the length of the inboard edge 30 when the leg cuff 24 is relaxed. This ability to retract when relaxed allows the extensible leg cuffs 24 to  
20 gather the base structure 28 in the crotch portion 14 and better fit users with small legs. The ability to stretch the outboard edge 32 of the leg cuffs 24 beyond the length of the inboard edge 30 allows for a more comfortable fit for a user with large legs. Accordingly, for a given size (e.g. length, width, area, etc.) of base structure 28, the  
25 enhanced expansion and contraction capabilities of leg cuffs 24, relative to the relatively less expansible base structure, provides a relatively wider range of sizes of users/people on which an absorbent article of the given size can readily be used.

30 Preferably, the extensible leg cuffs 24 also provide the entire source of retractile elastic tension for the opposing longitudinal sides of the crotch portion 14 of the absorbent article 8.

For a rectangular or like configuration, the size of the extensible leg cuffs 24 can be described in terms of a ratio of the length with respect to the width of the leg cuff 24. These length to width ratios  
35 are measured when the leg cuffs 24 are attached to the diaper chassis. The leg cuffs 24 generally have a length to width ratio of between about 2:1 and about 20:1. Preferably, the length to width ratio is between about 5:1 and about 15:1, most preferably approximately 7:1. The



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preferred width for the leg cuff 24 is approximately 1.5 inches. When the leg cuffs are mounted to the base structure 28, the leg cuffs 24 typically have an unattached width "Y" shown in Fig. 1 between the base structure 28 and the outboard edge 32 of between about 0.1 inch and 1.5 inches (up to the full-width of the leg cuff piece). The preferred unattached width is 1 inch. This unattached width, which is present at least in the center region of the leg cuffs 24, causes the leg cuffs 24 to operate and move with respect to a surface generally defined by base structure 28, substantially independently of the base structure 28 and responsive to only modest exertions of force, such as retractile forces of the leg cuffs 24 against the user's legs. This independent movement accompanied by the modest forces exerted on the user's legs, greatly increases the comfort of the leg cuffs 24 for a user's legs while maintaining a good barrier against transverse leakage of exudates past the leg cuffs 24.

Figs. 1-3 show extensible leg cuffs 24 attached to the base structure 28 of the absorbent article 8 at a preferred angle 25 of 15 degrees with respect to the longitudinal axis 15. The apex of the angle 25 is located frontwardly towards the front portion 10 of the absorbent article 8 as shown in Figs. 1-3. While an angle 25 of between 0 degrees and 30 degrees is considered effective for applicants' invention, a range for the angle 25 of approximately 5 degrees to 25 degrees is considered the preferred range for placement of the leg cuff 24.

Due to (i) the mounting angle 25 of the leg cuff 24, (ii) the position of the outboard edges 32 of the leg cuff 24 outwardly from the lateral edge 33 of the base structure 28, and (iii) the soft stretchable material which forms the leg cuff 24, desired properties are conferred to the absorbent article 8. For instance, the angle 25 and the relatively narrow crotch width, in combination, attenuate the tendency of the front portion 10 of the absorbent article 8 to be pulled downward in response to movement of the user's legs. The angle 25 also improves the buttocks coverage by conforming the absorbent article 8 more closely to the shape of a user's body. The above factors all improve the ability of the absorbent article 8 to provide a comfortable and effective seal of the user's legs. The preferred outward spacing of the outboard edge 32 of the leg cuffs 24 from the lateral edges 33 of the base structure 28 also allow one to reduce the width of the crotch e.g. between lateral edges 33, whereby lateral edges 33 play no direct role in forming a seal about

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the user's legs. Rather such seal is formed by leg cuffs 24.

Accordingly, at least the outboard edges 32 of the leg cuffs 24 operate and move independently of the base structure 28. This attachment arrangement also allows the outboard edges 32 of the leg cuffs 24 to  
5 achieve a unique compound curvature due to minimizing the anti-gathering influence of the base structure 28 of the absorbent article 8 at outboard edges 32.

Figs. 1-3 show exemplary shapes for the leg cuffs 24. Fig. 1 shows a typical rectangular shape for the leg cuffs 24. This shape is  
10 relatively easy to attach and glue to an absorbent article 8 during a construction process. Fig. 2 shows a typical elliptical pattern for the leg cuff 24. Fig. 3 shows an exemplary contoured pattern for the leg cuff 24 which may be customized or altered in any desired manner to fit a particular type of user or absorbent article 8. For example, the leg  
15 cuff 24 can comprise a curved shape where both the outboard edge 32 and the inboard edge 30 of the leg cuff 24 are curved with different or the same radii and substantially tailored to the shape of the leg cut out 31.

Those skilled in the art will now see that certain modifications can be made to the invention herein disclosed with respect to the illustrated  
20 embodiments, without departing from the spirit of the instant invention. And while the invention has been described above with respect to the preferred embodiments, it will be understood that the invention is adapted to numerous rearrangements, modifications, and alterations, and all such arrangements, modifications, and alterations are intended to be  
25 within the scope of the appended claims.

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**CLAIMS**

Having thus described the invention, what is claimed is:

1. An absorbent article having a front portion, a rear portion and a crotch portion connecting said front and rear portions, a longitudinal axis extending through said front, rear and crotch portions, said absorbent article having opposing longitudinal sides with said longitudinal axis disposed therebetween, said absorbent article comprising:
- (a) an outer cover;
  - (b) a bodyside liner mounted to said outer cover, said outer cover and said bodyside liner forming, in combination, a base structure;
  - (c) an absorbent core located between said bodyside liner and said outer cover; and
  - (d) first and second extensible leg cuffs attached to said base structure along the respective opposing longitudinal sides of said absorbent article at said crotch portion, said leg cuffs being partially stretched when said base structure is fully extended,

whereby said leg cuffs retract and gather said base structure in said crotch portion when said extensible leg cuffs are relaxed.

2. An absorbent article of claim 1 wherein said leg cuffs each have an outboard edge spaced outwardly from a respective lateral edge of said base structure and an inboard edge mounted upon a respective portion of said base structure, each said outboard edge being attached at ends thereof to the respective said portion of said base structure.

3. An absorbent article of claim 1, wherein said leg cuffs each have an outboard edge spaced outwardly from a respective lateral edge of said base structure, at least the respective said outboard edges of said leg cuffs remaining further extensible when said base structure upon which said leg cuffs are mounted is fully extended.

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4. An absorbent article of claim 1 wherein said leg cuffs each have an outboard edge spaced outwardly from a respective lateral edge of said base structure, at least said outboard edges of the respective said leg cuffs being movable independent of said base structure of said absorbent article.

5. An absorbent article of claim 1, an entire surface of each of the respective said leg cuffs that face said base structure being attached to said base structure at respective portions thereof.

6. An absorbent article of claim 1, each respective said leg cuff having an unattached width thereof, between a respective lateral edge of said base structure and an outboard edge of the respective said leg cuff, of between about 0.1 inch and 1.5 inches.

7. An absorbent article of claim 1 wherein said leg cuffs are stretched from 5% to 95% of a total potential elongation of said leg cuffs when said base structure is fully extended.

8. An absorbent article of claim 7 wherein said leg cuffs are stretched between 50% and 80%, of the total potential elongation of said leg cuffs, when said base structure is fully extended.

9. An absorbent article of claim 1 wherein said leg cuffs have a maximum elongation of approximately 200% of the relaxed length of said leg cuffs.

10. An absorbent article of claim 9 wherein said leg cuffs are approximately 1.5 inches wide and exert approximately 225 grams of retractile force at 90% ultimate elongation.

11. An absorbent article of claim 1 wherein said leg cuffs have a rectangular shape.

12. An absorbent article of claim 1 wherein said leg cuffs have an elliptical shape.

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13. An absorbent article of claim 1 wherein said leg cuffs have a contoured shape.

14. An absorbent article of claim 1 wherein said leg cuffs have a length to width ratio between 2:1 and 20:1.

15. An absorbent article of claim 1 wherein said leg cuffs have a length to width ratio of between 5:1 and 15:1.

16. An absorbent article of claim 1 wherein said leg cuffs have a length to width ratio of approximately 7:1.

17. An absorbent article of claim 1 wherein said leg cuffs comprise a laminate including first and second outer nonwoven facing layers on opposing sides of an elastomeric core layer.

18. An absorbent article of claim 17 wherein said elastomeric core layer comprises a styrene ethylene butylene styrene terpolymer.

19. An absorbent article of claim 1 wherein said leg cuffs are attached to said bodyside liner.

20. An absorbent article of claim 1 wherein said extensible leg cuffs are an entire source of elastic tension for the opposing longitudinal sides at said crotch portion of said absorbent article.

21. An absorbent article of claim 1 wherein said leg cuffs each have an outboard edge spaced outwardly from a respective lateral edge of said base structure and wherein when an inboard edge is mounted upon a respective portion of said base structure, each said outboard edge is stretchable to a length greater than a respective length of said inboard edge and is retractable to a length less than the respective length of said inboard edge.

22. An absorbent article of claim 1 wherein containment flaps are mounted upon said bodyside liner along each of the opposing longitudinal sides at said crotch portion in a substantially parallel direction with respect to said longitudinal axis, said containment flaps being spaced

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5 inwardly from said leg cuffs.

23. An absorbent article having a front portion, a rear portion and a crotch portion connecting said front and rear portions, a longitudinal axis extending through said front, rear and crotch portions, said absorbent article having opposing longitudinal sides, with said  
5 longitudinal axis disposed therebetween, said absorbent article comprising:

- (a) an outer cover;
- (b) a bodyside liner mounted to said outer cover, said outer cover and said bodyside liner forming, in combination, a base  
10 structure;
- (c) an absorbent core located between said bodyside liner and said outer cover; and
- (d) first and second extensible leg cuffs attached to said base  
15 structure along the respective opposing longitudinal sides of said absorbent article at said crotch portion, said leg cuffs each having an outboard edge spaced outwardly from a respective lateral edge of said base structure, and an inboard edge mounted upon a respective portion of said base structure,

20 whereby each said outboard edge is stretchable to a length greater than the length of said respective inboard edge and each said outboard edge being retractable to a length less than the length of said respective inboard edge.

24. An absorbent article of claim 23 wherein said extensible leg cuffs are an entire source of elastic tension for the opposing longitudinal sides at said crotch portion of said absorbent article.

25. An absorbent article of claim 23, an entire surface of each of the respective said leg cuffs that face said base structure being attached to said base structure at the respective said portions thereof.

26. An absorbent article of claim 23 wherein said leg cuffs are stretched from 50% to 80% of a total potential elongation of said leg cuffs, when said base structure is fully extended.

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27. An absorbent article of claim 23 wherein said leg cuffs have a rectangular shape.

28. An absorbent article of claim 23 wherein said leg cuffs have an elliptical shape.

29. An absorbent article of claim 23 wherein said leg cuffs have a contoured shape.

30. An absorbent article of claim 23 wherein said leg cuffs have a length to width ratio between 2:1 and 20:1.

31. An absorbent article of claim 23 wherein said leg cuffs comprise a laminate including first and second outer spunbonded facing layers on opposing sides of an elastomeric core layer.

32. An absorbent article of claim 31 wherein said elastomeric core layer comprises a styrene ethylene butylene styrene terpolymer.

33. An absorbent article of claim 23 wherein containment flaps are mounted upon said bodyside liner along each of the opposing longitudinal sides of said absorbent article at said crotch portion in a substantially parallel direction with respect to said longitudinal axis, said  
5 containment flaps being spaced inwardly from said leg cuffs.

34. An absorbent article having a front portion, a rear portion and a crotch portion connecting said front and rear portions, a longitudinal axis extending through said front, rear and crotch portions, said absorbent article having opposing longitudinal sides, with said  
5 longitudinal axis disposed therebetween, said absorbent article comprising:

- (a) an outer cover;
- (b) a bodyside liner mounted to said outer cover, said outer cover and said bodyside liner forming, in combination, a base  
10 structure;
- (c) an absorbent core located between said bodyside liner and said outer cover; and

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15 (d) first and second extensible leg cuffs attached to said base structure along the respective opposing longitudinal sides of said absorbent article at said crotch portion, said leg cuffs each being mounted at an angle between 5 degrees and 25 degrees with respect to said longitudinal axis, the apex of the angle being located toward said front portion of said absorbent article,

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whereby said absorbent article substantially conforms to the shape of a user's body when mounted thereon.

35. An absorbent article of claim 34 wherein said leg cuffs each have an outboard edge spaced outwardly from a respective lateral edge of said base structure and an inboard edge mounted upon a respective portion of said base structure, each said outboard edge being attached at ends thereof to the respective said portion of said base structure.

36. An absorbent article of claim 34, wherein said leg cuffs each have an outboard edge spaced outwardly from a respective lateral edge of said base structure, at least the respective said outboard edges of said leg cuffs remaining further extensible when said base structure upon which said leg cuffs are mounted is fully extended.

37. An absorbent article of claim 34 wherein said leg cuffs each have an outboard edge spaced outwardly from a respective lateral edge of said base structure, at least said outboard edges of the respective said leg cuffs being movable independent of said base structure of said absorbent article.

38. An absorbent article of claim 34, an entire surface of each of the respective said leg cuffs that contact said base structure being attached to said base structure at respective portions thereof.

39. An absorbent article of claim 34 wherein said leg cuffs are stretched from 50% to 80% of a total potential elongation of said leg cuffs when said base structure is fully extended.



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40. An absorbent article of claim 34 wherein said leg cuffs have a rectangular shape.

41. An absorbent article of claim 34 wherein said leg cuffs have an elliptical shape.

42. An absorbent article of claim 34 wherein said leg cuffs have a contoured shape.

43. An absorbent article of claim 34 wherein said leg cuffs have a length to width ratio between 2:1 and 20:1.

44. An absorbent article of claim 34, wherein said leg cuffs are formed by a laminate including first and second outer spunbonded facing layers on opposing sides of an elastomeric core layer.

45. An absorbent article of claim 44, wherein said elastomeric core layer comprises a styrene ethylene butylene styrene terpolymer.

46. An absorbent article of claim 34 wherein said extensible leg cuffs are the entire source of elastic tension for the opposing longitudinal sides at said crotch portion of said absorbent article.

47. An absorbent article of claim 34 wherein said leg cuffs each have an outboard edge spaced outwardly from a respective lateral edge of said base structure and wherein when an inboard edge is mounted upon a respective portion of said base structure, each said outboard edge is stretchable to a length greater than a respective length of said inboard edge and is retractable to a length less than a respective length of said inboard edge.

48. An absorbent article of claim 34 wherein containment flaps are mounted upon said bodyside liner along each of the opposing longitudinal sides at said crotch portion in a substantially parallel direction with respect to said longitudinal axis, said containment flaps being spaced inwardly from said leg cuffs.

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49. An absorbent article having a front portion, a rear portion and a crotch portion connecting said front and rear portions, with a longitudinal axis extending through said front, rear and crotch portions, said absorbent article having opposing longitudinal sides with said longitudinal axis disposed therebetween, said absorbent article comprising:

- (a) an outer cover;
- (b) a bodyside liner mounted to said outer cover, said outer cover and said bodyside liner forming, in combination, a base structure;
- (c) an absorbent core located between said bodyside liner and said outer cover; and
- (d) first and second extensible leg cuffs attached to said base structure along the respective opposing longitudinal sides of said absorbent article at said crotch portion, said leg cuffs being partially stretched when said base structure is fully extended, said leg cuffs being stretched a different length at an inboard edge which is mounted upon a respective portion of said base structure than a length at an outboard edge of said leg cuff,

whereby said leg cuffs retract and gather said base structure in said crotch portion when said extensible leg cuffs are relaxed.

50. An absorbent article of claim 49 wherein said different length at said inboard edge of said leg cuff comprises a greater length than the length at said outboard edge of said leg cuff.

51. An absorbent article of claim 49 wherein said different length at said inboard edge of said leg cuff comprises a smaller length than the length at said outboard edge of said leg cuff.

52. An absorbent article of claim 49 wherein said different length of each respective said inboard edge with respect to each respective said outboard edge of each said leg cuff shapes each respective said leg cuff in a curved manner when attached to said base structure.

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53. An absorbent article of claim 49 wherein at least said outboard edges of said leg cuffs are spaced outwardly from a respective lateral edge of said base structure, at least the respective said outboard edges of said leg cuffs remaining further extensible when said base structure upon which said leg cuffs are mounted is fully extended.

54. An absorbent article of claim 49 wherein each respective said leg cuff has an unattached width thereof, between a respective lateral edge of said base structure and said outboard edge of the respective said leg cuff, of between about 0.1 inch and 1.5 inches.

55. An absorbent article of claim 49 wherein said leg cuffs comprise a rectangular shaped material, said different length of each respective said inboard edge of each said leg cuff shaping each respective said rectangular material in a curved manner when attached to said base structure.

56. An absorbent article of claim 49 wherein said leg cuffs have an elliptical shape.

57. An absorbent article of claim 49 wherein said leg cuffs comprise a laminate including first and second outer nonwoven facing layers on opposing sides of an elastomeric core.



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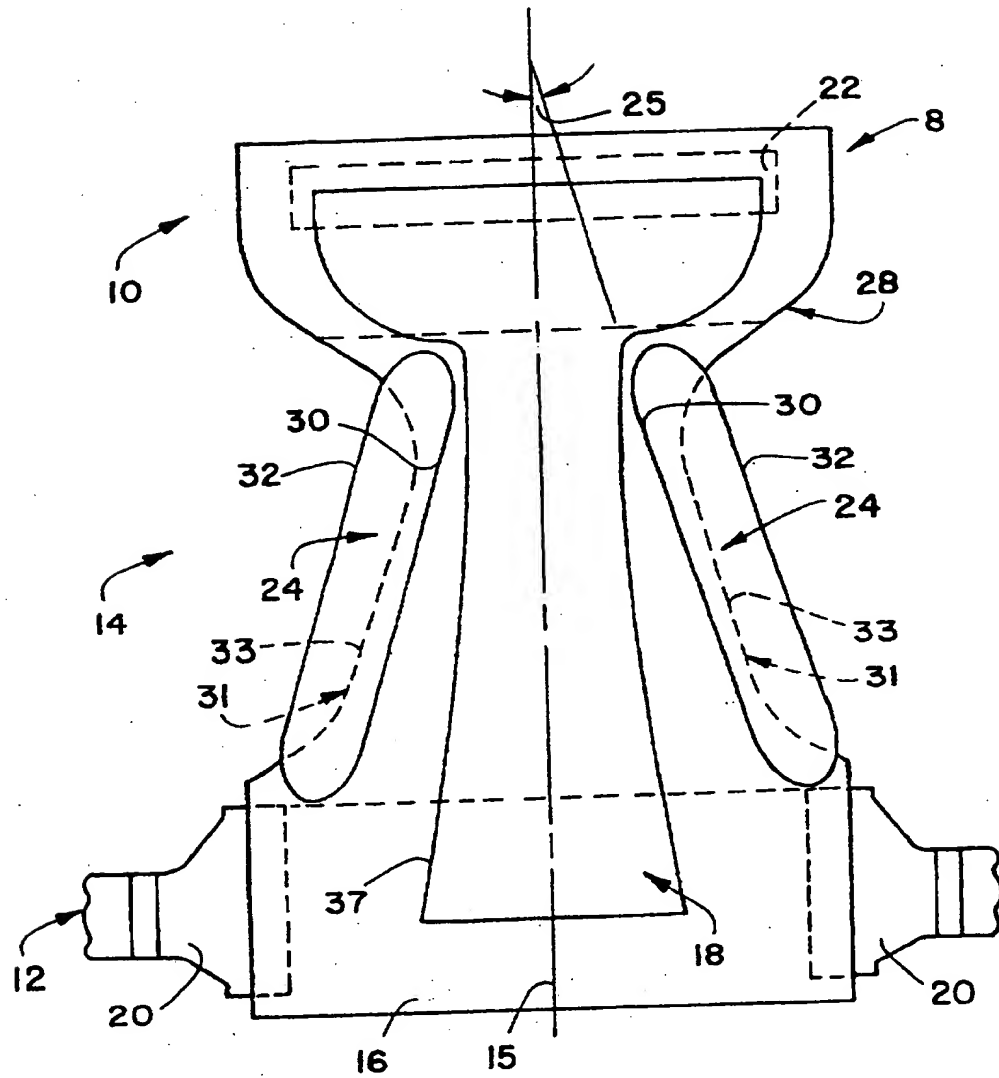


FIG. 2

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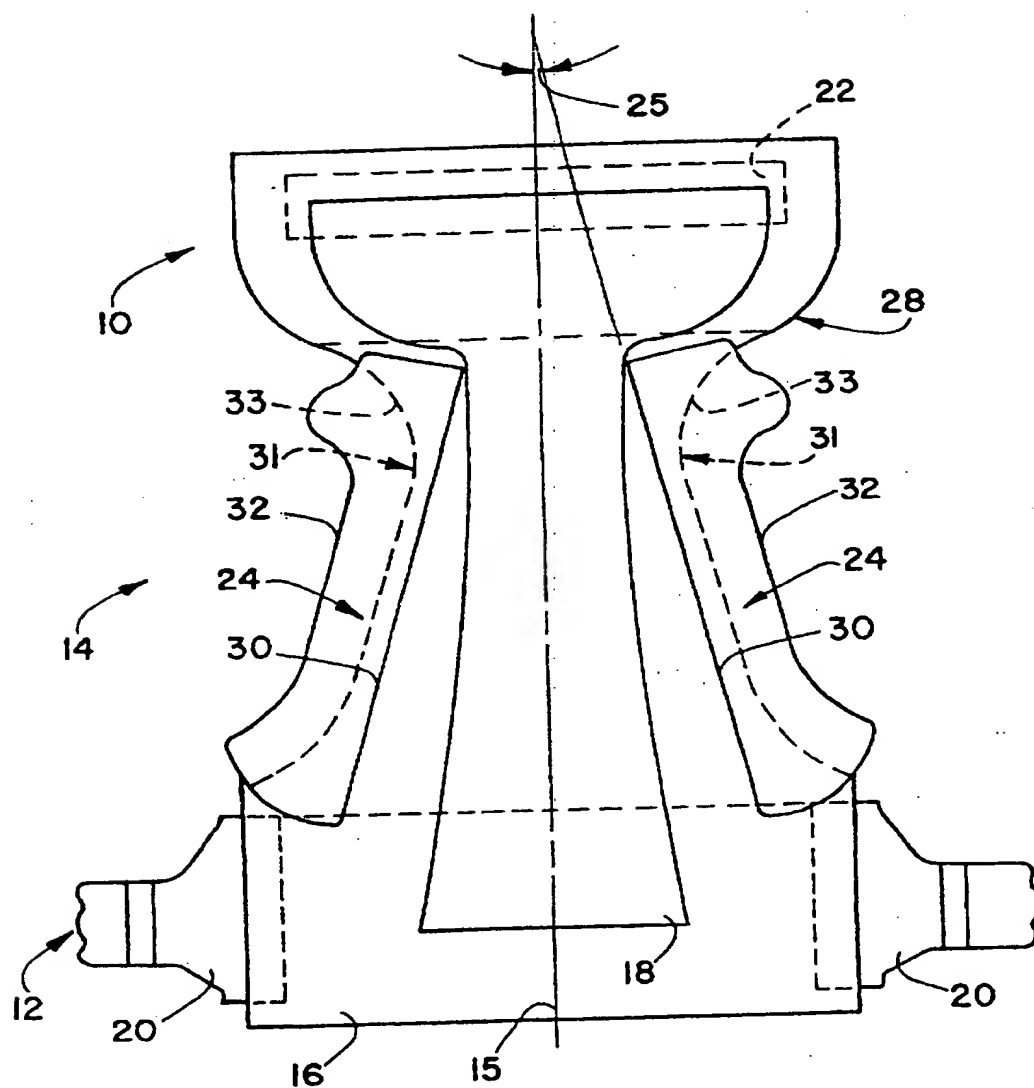


FIG. 3

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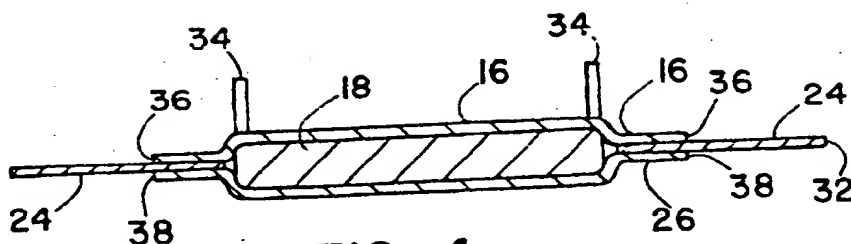


FIG. 4

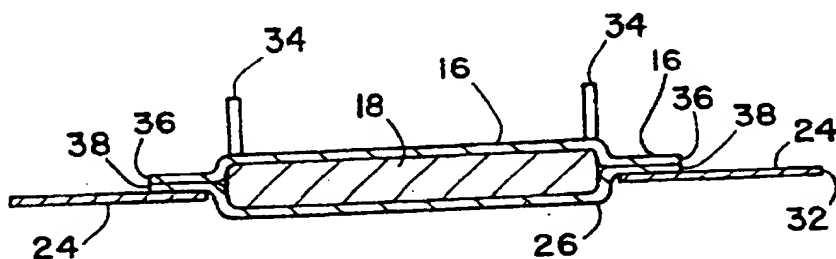


FIG. 5

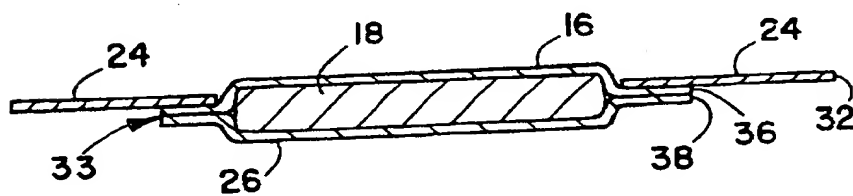


FIG. 6

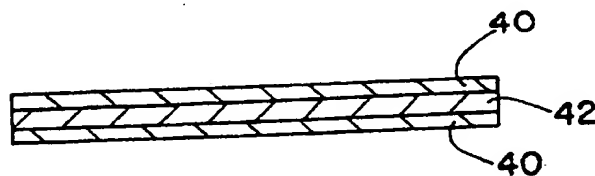


FIG. 7

## INTERNATIONAL SEARCH REPORT

International Application No  
PCT/US 96/17962

<b>A. CLASSIFICATION OF SUBJECT MATTER</b> IPC 6 A61F13/15		
According to International Patent Classification (IPC) or to both national classification and IPC		
<b>B. FIELDS SEARCHED</b> Minimum documentation searched (classification system followed by classification symbols) IPC 6 A61F		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practical, search terms used)		
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 433 951 A (KIMBERLY-CLARK) 26 June 1991  see column 6, line 21 - line 25; figure 3 ---	1-3,6, 13,17, 19,20,22
X	EP 0 528 282 A (KIMBERLY-CLARK) 24 February 1993  see column 8, line 32 - line 44; figure 11 ---	34,38, 40,42, 44,46,48
A	EP 0 532 034 A (KIMBERLY-CLARK) 17 March 1993 -----	
<input type="checkbox"/> Further documents are listed in the continuation of box C. <input checked="" type="checkbox"/> Patent family members are listed in annex.		
* Special categories of cited documents : "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another claim or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search  23 April 1997		Date of mailing of the international search report  02.05.97
Name and mailing address of the ISA European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016		Authorized officer  Hagberg, A

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## INTERNATIONAL SEARCH REPORT

Information on patent family members

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